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The Battle Against Saltcedars (*Tamarix* spp.)



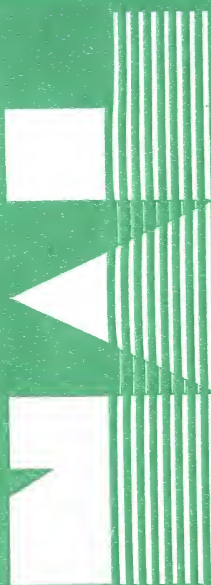
*The saltcedar
leaf beetle*



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Saltcedars or tamarisks (*Tamarix* L.) are shrubs or small trees native to southern Europe, Asia, and northern Africa. The common name—saltcedar—is derived from the plants' tolerance of saline conditions and the resemblance of the small scale-like leaves to cedar or juniper foliage. At least eight exotic saltcedar species were introduced into the United States in the 19th and 20th centuries for ornamentals, windbreaks, livestock shade, and erosion management. Saltcedars escaped from cultivation by the late 1800s, and weedy saltcedar populations expanded dramatically in the Western United States throughout the 1900s. *Tamarix chinensis* and *T. ramosissima* species are the two most widespread species in western North America.

Saltcedars are aggressive colonizers that are able to survive in a wide variety of habitats. Once established, saltcedars are difficult and expensive to control. In 2000, a study by Zavaleta ("Valuing ecosystem services lost to *Tamarix* invasion in the United States") estimated that saltcedar-induced losses to water, agriculture, and wildlife populations will cost between \$127 million and \$291 million to U.S. consumers, producers, and the natural environment over a 55-year period.

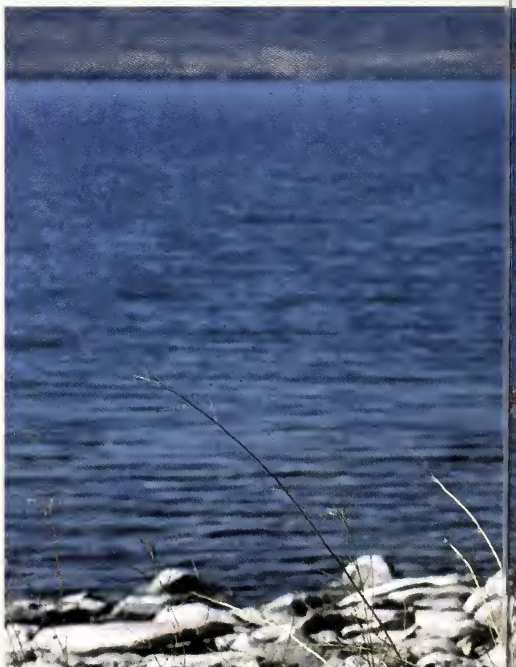


The lifespan of a saltcedar plant is 50 to 100 years.

Saltcedars will invade bare, exposed, or overgrazed land and are able to survive in a wide variety of habitats.

Distribution and Habitat

Naturalized exotic saltcedars are found in more than 35 States. Invasive saltcedars may be found in areas below sea level to about 6,889 feet in elevation. They are typically found near rivers, streams, canals, irrigation ditches, reservoirs, lakes, ponds, and salt marshes. In fact, saltcedars use but do not depend on ground water. Saltcedars can occur in areas where their roots can reach the water table, such as floodplains, along irrigation ditches, and on lake shores. Plants usually grow where the depth to ground water does not exceed approximately 9 to 16 feet. Saltcedar forms dense thickets where the ground water lies from approximately 5 to 20 feet below the soil surface, but forms an open shrub-land where ground water is deeper than 20 feet.



Impact

Saltcedars are occasional weeds with minor impacts in the Eastern United States. However, in the Western United States, saltcedars are highly invasive weeds that infest more than 1.5 million acres (610,000 ha), causing economic losses that exceed \$250 million annually. Invasive saltcedars can cause serious environmental damage by consuming excessive amounts of water, displacing native plant communities, increasing wildfire frequency and flooding risks, reducing wildlife habitats and recreational areas, and increasing the salinity of soil. In turn, these environmental conditions indirectly cause economic hardship to the agricultural industry, municipal and regional water suppliers, and local governments.



A large saltcedar tree can absorb excessive amounts of water every day, giving heavy infestations the ability to dry up creeks and small lakes.

General Biology

Saltcedars are typically less than 30 feet tall, often exhibit a many-branched growth form, and may form very dense wood. Saltcedar branches are slender, flexible, and have reddish-brown or purplish bark. Trunks usually have brown bark that is smooth in young plants but becomes increasingly furrowed with age. Saltcedar leaves are scale-like and cover the small slender stems in an alternate, overlapping arrangement. Leaves are very small (less than 0.15 inches long) and are usually oval in shape, with a sharp or rounded point. Foliage can range from dark-green to bluish-green in color. Almost all introduced saltcedars are deciduous, with aging leaves that turn yellow and drop from plants in the fall. However, *Tamarix aphylla*, found only in the far southwestern United States, retains its leaves all year. Saltcedars can flower throughout the growing season, from late spring through early fall. Saltcedar flowers are small (0.1 to 0.2 inches in diameter) and white, pink, or red in color. Flowers are arranged in slender, elongated clusters (about 1 to 4 inches long) and are pollinated by insects or wind.

Saltcedar
flowers are
white, pink,
or red in color
and will bloom
from mid- to
late summer.



Reproduction

Saltcedar flowers produce small oval capsules (less than 0.2 inches long) that are pink or greenish-yellow. Capsules break apart at maturity to release seeds. Saltcedar seeds are minute (<.04 inches) and have a terminal tuft of hair. Seeds are easily dispersed by wind over distances exceeding one mile and can be transported by flowing water. A mature saltcedar plant may produce 250,000 to 1 million or more seeds each year.

However, saltcedar seeds remain viable for only a few weeks. Since few seeds successfully overwinter, there is no persistent seedbank.

Saltcedar seeds can germinate anytime during the growing season as long

as soil moisture is constant for 2 to 4 weeks. The best germination substrate is moist silty soil, which may be found on receding river and lake margins, freshly-exposed soil or sediments deposited by a river or other running water, and disturbed, flooded areas. Saltcedar seedlings do not tolerate flooding or shading by other plants. Under favorable conditions, very high seedling densities are possible (up to 1,000 or more per square foot), but less than 10 percent typically survive the first year. All saltcedars reproduce by seeds, but many of the species can also reproduce vegetatively, via layering or sprouting from stems and roots.



Saltcedar seeds have a tuft of fine hair that aids in dispersing the plant through wind and water.

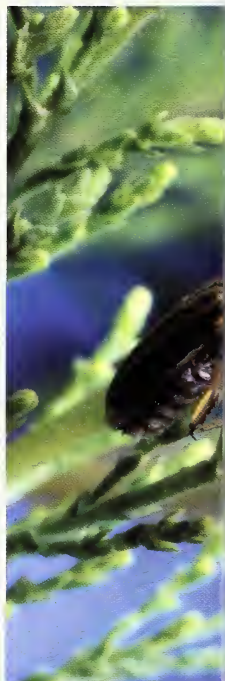
Biological Control

Biological control is the use of introduced natural enemies to control an exotic pest or weed. The goal of biological control is to utilize feeding damage to reduce a weed's abundance, thus providing permanent, cost-effective weed control, but not eradication.

Surveys conducted in southern Europe, Russia, western and central Asia, northern Africa, and China identified more than 300 saltcedar-feeding insects.

The U.S. Department of Agriculture's (USDA) Agricultural Research Service (ARS) has researched and developed an effective biocontrol program for saltcedar using the saltcedar leaf beetle or tamarisk beetle, *Diorhabda elongata*. This beetle is native throughout southern Europe, Asia, and northern Africa. Because the beetle can only survive and successfully reproduce on saltcedars, it does not harm native vegetation or crop plants. USDA's Animal and Plant Health Inspection Service (APHIS) has conducted environmental analyses and approved and recommended the release of *D. elongata* in several Western States, including Texas, for biologically controlling saltcedar infestations. Presently, the

*Beetles and
larvae consume
the foliage
of the salt-
cedar plant,
thus reducing
chlorophyll
production,
photosynthesis,
and ultimately,
the plant's food
sources. Over
time, this
process
weakens and
eventually kills
the plant.*

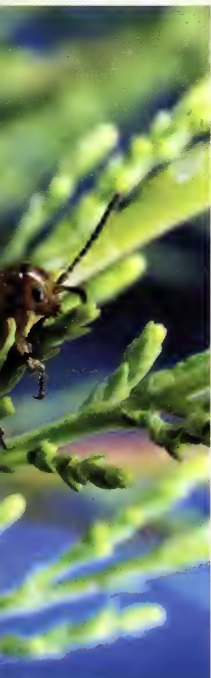


saltcedar leaf beetle or tamarisk beetle, *D. elongata*, is the only saltcedar biocontrol agent permitted for U.S. field release.

APHIS first approved field cage testing of the saltcedar leaf beetle in 1996, but the first environmental releases at pre-selected sites were not conducted until 2001. APHIS made the first implementation releases of the saltcedar leaf beetle in the United States in 2005, after addressing concerns over the potential effect of saltcedar control on an endangered species of insectivorous bird (the Southwestern Willow Flycatcher, *Empidonax traillii extimus*). A comparison conducted along the Lower Colorado River showed that insect production at sites dominated by a variety of native plant types (e.g., mesquite, willow, and cottonwood) exceeded insect production at saltcedar dominated sites. This infor-

mation indicates that saltcedar control will minimally affect the forage base for insectivores, which should increase as native plants replace saltcedar.

The current saltcedar leaf beetle implementation release program is a joint APHIS effort involving cooperators from universities, other Federal and State agencies, and local weed management officials. To date, there have been 48 insectary releases in 10 Western States.



Impacts on Saltcedars

Larvae and adults of saltcedar leaf beetles consume saltcedar foliage. Beetles feed on the upper and lower leaf surfaces rather than completely consuming saltcedar foliage, which results in residual leaf tissue that quickly desiccates and dies. Larval and adult feeding on older foliage and on the bark of small twigs disrupts water transport to younger foliage, leading to the desiccation and death of young leaves. Therefore, saltcedar foliage directly or indirectly damaged by beetle feeding first turns a dry, grayish color and then a distinctive reddish-brown.

*Larva
feeding on a
saltcedar
plant.*

Under outbreak conditions, beetles defoliate almost all trees over large areas. Though a single defoliation event may kill saltcedar seedlings, it is insufficient to kill established plants. Defoliated saltcedar plants are usually not defoliated again by *D. elongata*

during the same summer but can be defoliated repeatedly over successive years. After several years of defoliation, saltcedar branches begin to die. Saltcedars are resilient and difficult to kill, but repeated defoliations result in a significant depletion of food reserves and, eventually, plant death.



Additional Information

For more information on APHIS' biological control programs, please visit:
http://www.aphis.usda.gov/plant_health/plant_pest_info/biocontrol/index.shtml.

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